

of the United States are hermaphrodite and viviparous. Specimens from the coast of Oregon and Washington show that the same condition exists in the reproductive follicles as in those of *Ostrea edulis* of Europe. The presence of eggs and of spermatoblasts and spermatozoa in the same follicles is the invariable rule. The ova, like those of *O. edulis*, are much larger than those of *O. virginica*, though perhaps not quite so large as the former. The embryos are fertilized in the gill and mantle cavities, where they undergo development.

These north-west-coast oysters also resemble the oysters of Europe in that they are small and have little or no indication of purple pigment on the impression or point of insertion of the adductor muscle, which is so conspicuous a feature in *Ostrea virginica* of our eastern coast.—*Proc. Acad. Nat. Sci. Philad.* Nov. 15, 1892.

Large Variations in the Metamorphosis of the same Species.

An elaborate memoir entitled, "The Embryology and Metamorphosis of the Macroura," by W. K. Brooks and F. H. Herriek, makes 140 pages quarto of the fifth volume of the Memoirs of the U. S. National Academy of Sciences, and is illustrated by 57 plates. The species microscopically investigated and here reported upon are of the genera *Gonodactylus*, *Alpheus*, and *Stenopus*. The authors mention, in the introductory pages, as one remarkable result of their study of the genus *Alpheus*, the discovery that while the larval stages of different species are similar, the individuals of a single species sometimes differ more from each other as regards their metamorphoses than the individuals of two very distinct species, and make on this point the following remarks:—

This phenomenon has been observed by us and carefully studied in two species—*Alpheus heterochelis* and *Alpheus Saulcyi*—and it is described in detail, with ample illustrations, in the chapter on the metamorphosis of *Alpheus*. In the case of the first species the difference seems to be geographical, for while all the individuals which live in the same locality pass through the same series of larval stages, the life-history of those which are found at Key West is very different from that of those which live on the coast of North Carolina, while those which we studied in the Bahama Islands present still another life-history. In the case of the second species—*Alpheus Saulcyi*—the difference stands in direct relation to the conditions of life. The individuals of this species inhabit the tubes and chambers of two species of sponges which are often found growing on the same reef, and the metamorphosis of those which live in one of these sponges is sometimes different from that of those which inhabit the other. In this species the adults also are different from each other, but as we found a perfect series of transitional forms there is no good reason for regarding them as specifically distinct; and in the case of the other species—*Alpheus heterochelis*—we were unable, after the most thorough and minute comparison, to find any difference whatever between adults from North Carolina and those from the Bahama Islands, although their

life-histories exhibit a most surprising lack of agreement. In fact, the early stages in the life of *Alpheus heterochelis* in the Bahama Islands differ much less from those of *Alpheus minor* or *Alpheus Normani* than they do from those of the North Carolina *Alpheus heterochelis*; and, according to Packard, the Key West *heterochelis* presents still another life-history.

In the summer of 1881 I received the 'American Naturalist' with Packard's very brief abstract of his observations at Key West upon the development of *Alpheus heterochelis*, and read with great surprise his statement that this species has no metamorphosis, since, while still inside the egg, it has all the essential characteristics of the adult. As I had under my microscope at Beaufort on the very day when I read his account a newly hatched larva of the same species and was engaged in making drawings to illustrate the metamorphosis of which he denies the existence, and as my experience in the study of other Crustacea had taught me that all the larvæ of a species at the same age are apparently facsimiles of each other down to the smallest hair, Packard's account seemed absolutely incredible, and I hastily decided that, inasmuch as it was without illustrations and was written from notes made many years before, it involved some serious error and was unworthy of acceptance. This hasty verdict I now believe to have been unjust, since my wider acquaintance with the genus has brought to my notice other instances of equally great diversity between the larvæ of different specimens of a single species.

The phenomenon is, however, a highly remarkable one and worthy the most thorough examination, for it is a most surprising departure from one of the established laws of embryology—the law that the embryonic and larval stages of animals best exhibit their fundamental affinities and general resemblances, while their specific characteristics and individual peculiarities make their appearance later.—*Am. Journ. Sci.*, Feb. 1893, pp. 166, 167.

Absorption in the Actiniæ and the Origin of the Mesenterial Filaments.

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If albumen stained with carmine is administered to specimens of *Actinia* or *Sagartia* it is found that at the end of a few hours particles of carmine are present in the cells of the lining of the enteric cavity. Properly speaking this absorption does not take place in the enteroids, as is stated by Krukenberg* and Metschnikoff †, but at first and chiefly in the region of the radial partitions which adjoins these filaments, a region where the epithelium forms a thickening parallel with the edge of the septum ‡; the grains of

* Krukenberg, "Ueber den Verdauungsmodus der Actinien," *Vergl.-phys. Studien an der Küste der Adria*, 1 Abth., 1880.

† Metschnikoff, "Ueber die intracellulare Verdauung bei Coelenteraten," *Zool. Anz.* 1880, p. 261.

‡ *Vide* Hertwig, "Die Actinien," *Jenaische Zeitschrift*, 1879, Taf. xxi. fig. 13.